Engineering Man Power for Real Economy

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THE ROOT OF THE PROBLEM IS SECONDARY SCHOOL

There seems to be a persistent paradox in Russia today - with an increasing number of university or college graduates there is still an increasing lack of young, creative engineers and technical workers. The number of people with non-technocratic way of thinking prevails in our society, despite the fact that universities do not offer students any state-funded places at educational programmes in management or humanities. According to the labor market forecast we will face a significant shortage of engineers by 2015.

Statistics show and large Russian recruiting agencies confirm that day after day there is a growing demand for professionals in such fields as information technology (IT), mechanical engineering, power engineering, civil engineering and woodworking. Moreover, with economic development the need for this kind of professionals with higher and secondary professional education is increasing.

The main task of educational institutions is not only to train, but also to help students to discover the right way. So, after choosing their future profession, they would be able to realize themselves in it. Therefore, today's secondary school graduates should properly evaluate the prospects of the chosen educational programme. Supervising teachers, school directors and university representatives are expected to help their students in it.

In order to satisfy country's demand in highly qualified engineers by 2015 it is urgently needed to change the attitude to natural sciences of secondary school and university managers and students. For example, in some graduate classes it is given only one hour a week for the teaching of physics - taking into account the current realities, it is simply unacceptable. After all, knowledge of physics is required for the majority of

Global financial crisis reminded that Russia lacks highly qualified, adapted to the market specialists without who it is impossible to improve economy. With a diploma on higher education, alumni should immediately start work, applying innovative knowledge and skills, being able to introduce them. But how should the specialists be trained? What do we need to start with? What are the problems technical universities face with? Are there universities ready to share their specific results in training engineers, who can already meet the demands of the current industrial environment? These are the main issues discussed in the article.

engineering specialties at university. In the short run, we have to revise and upgrade al existent educational standards so that students could get sufficient knowledge in natural sciences.

The problem should be solved with universities assistance. Our university for example, allocated one million rubles from its own funds for additional - one hour a week - lessons in physics in each graduating class of the Republic of Mari El.

And we are going to double or triple this investment next year. In addition, MarSTU has developed an entire assistance programme for Mari El schools in teaching of natural sciences.

After passing entry exams a lot of university applicants, especially from rural areas, face such problem as the lack of knowledge to study successfully on higher education programmes. And this is rather their trouble than a fault. To help low achieving first-year students to fill in the gaps in their knowledge, "aligning groups" were organized at MarSTU: qualified teachers help those lagging behind to catch up with a core group of students; at the very beginning it is important to read and properly understand the information, acquire and apply new knowledge. Moreover - with the current academic year so-called preparatory module has been introduced at the university: within first three weeks students are engaged in repeating the bases of school programme major disciplines of each faculty - physics, chemistry, graphics, foreign languages. Although it is too early to review the experiment results, I am sure there will be an obvious progress. The only question is how successful we could be in tying up the loose ends of secondary school [1].

Another crucial task of the preparatory module is to identify among first-year students the most talented and creative. For this purpose we have developed a system of tests aimed at determing the competence level of our newcomers. All the tasks in the test they need to complete differ from each other. Some students receive less complicated tasks - to learn the basics of the minimum level knowledge, and the advanced students deal with high complexity tasks that require quick wits and ability to find innovative solutions. Such talented students will be invited to join educational programmes of high complexity. They will defend the honor of the university at competitions, scientific exhibitions and conferences. And at the senior-year courses these students are expected to form creative business teams capable to respond real challenges.

In the recently accepted strategic plan of advancement of MarSTU for the next five years it is pointed out that in addition to traditional training of qualified engineers, we should think about training of elite engineers that are able to invent and research, develop innovative technologies and, finally, achieve economic progress.

FIRST PRIORITY – COOPERATION BETWEEN HIGHER EDUCATION AND INDUSTRY

"Achilles' heel" of our higher education is its dramatic isolation from industry. Although it remains strong enough and respected in the field of fundamental research, it still has not become a reliable base for building modern innovative economy.

There is a serious blank between a professional training at university and real applying of graduates' skills. This is a great problem of the whole education system that continues to prepare certified theorists, while there is an increasing need of "doers" – experts in mechanical engineering, radio electronics, civil engineering, agricultural and wood industry and other branches of our economy, who can combine specific professional knowledge with managerial skills, teamwork skills and entrepreneurial flair.

We have to acknowledge that during the reforms at the end of the last century, the majority of strategic branches of our economy lost their developments without creating new ones. The market oriented firms which have appeared in industry are yet not ready to follow the example of economically developed countries in supervising the main source of their staff – educational institutions. Quite often business representatives are even not able to inform colleges and universities about their personnel needs. So the gap between higher education system and industry continues to grow.

In my opinion, professional engineers should be trained on the base of sectoral universities and multilevel higher education complexes – with advanced educational technologies and research developments, and the main fact – real mutually beneficial cooperation with industrial enterprises.

There should be an opportunity not only to train, but also to retrain different kind of experts to meet the requirements of industry branches and particular successful enterprises.

Can it be realized? Is it possible to convince business in importance of such cooperation? I am sure the answer is YES, if we focus our efforts to achieve this goal. In a business portfolio of our university there are ongoing contracts with dozens of successful enterprises and the organizations which supervise them. Their heads make concrete and sometimes well-paid orders to the research departments of our university, invite students for practical training, selecting the best ones for real job.Such interaction scheme became real after long years of hard work and cooperating with heads of these companies, a lot of them are our graduates and members of the MarSTU Board of Trustees. They take an active part in all serious projects of the university.

At the same time the academic staff members of our university should be retrained, as the major part of them have last century dated professional skills, in direct and figurative sense. They do not have real work experience for industrial companies, neither for modern and advanced, nor for the old ones. That is why the main goal is to fill in this gap using several possible ways, for example to engage successful businessmen in the training process.

When training modern experts it is important to focus not only in engineering aspects, but also on the management and computer skills, foreign language qualifications and ability to find out information and use it effectively. It should be essential for modern engineer to combine roles of manager and researcher, and to have enough skills in business running. Such specialists could be trained only on the base of sectoral higher education complexes with modern facilities, effective educational technologies, highly qualified faculty, engaged in real economy activities [2].

A modern university should include different levels of education. This idea was realized in MarSTU when a multilevel university complex was founded. With new status the university offers educational programmes for different degrees: qualified industrial worker - technician - bachelor - engineer - master - candidate of science (PhD) - doctor of science. It is supposed that every next level improves and develops acquired knowledge and skills of the previous one. Starting with college gives our students good chances to become top managers in the future. These opportunities are ensured by coherent curriculum across the university and by implementing block-mode training and rating technologies, so-called RYTHM system.

AN ENGINEER AND AN INDUSTRIAL WORKER – IN ONE PERSON

It is obvious that in recent years functions required from industrial workers, technicians, engineers have become much more complicated. If formerly the lack of specific knowledge could be balanced by practical industrial experience, now it is rapidly becoming necessary be trained at graduate degree engineering programme in order to manage complex technological processes effectively. Professionals working in modern industrial branches need to have a deep understanding of computers and high-tech equipment. They are both engineers able to analyze, think creatively, learn and apply new skills, and highly qualified industrial workers at the same time.

After careful consideration of this matter focusing on economic requirements, the government of the Russian Federation decided to develop essentially new educational programmes at universities and vocational schools-Applied Engineering Bachelor programmes [3]. Mari El State technical university joined the list of universities that has been taking part in the experiment of generating new wave of engineers.

The system of training Bachelors of Applied Engineering is widespread abroad: in Germany, the Netherlands, Belgium, Denmark, Sweden, Norway, Ireland, Portugal, Greece etc. In Finland, for example, bachelors of Applied Science are trained at special high schools, so-called polytechnics. Meanwhile universities offer traditional bachelor programmes. Graduates of both polytechnics and traditional universities have opportunity to continue their education at master level at Finnish universities, for example, the largest one - the University of Helsinki.

Within several internships abroad I had several opportunities to see how

blue-collar workers and average technical staff are highly thought of in Western Europe and other industrial countries. They have practical skills to work with modern equipment.

Perhaps they are even more valued than engineers, thanks to the wider scope of their professional skills. The status of these professionals has only grown over time. They are aimed at acquiring new knowledge, and if necessary continue their professional training. I am sure we will also achieve this goal. Employers have already declared their wish to get our best students, keeping track of their progress at the university and during practical training at real enterprises. Moreover our university has its own facilities for practical lessons. There are modern equipped laboratories and computer classes at MarSTU. With the new academic year we have opened the Centre of computer-aided engineering with unique robotic equipment. It was opened on the base of college "Polytechnic". All these facilities are available for our students.

In addition, the Institute of Lifelong Learning was founded in MarSTU a few years ago. It allows today's managers and engineers to study and improve their skills to meet the modern requirements. And at the same time, taking part in solving real engineering problems permits to retrain our teachers, who in turn will teach and produce competent and skilled professionals.

INNOVATIONS - THE PATH TO SUCCESS

Nowadays state requirements to the higher education institutions are more than ever high. If the minimum objective of modern universities is to train specialists, adapted to the market conditions, then the maximum objective is to match the innovation requirements.

Back in the mid-nineties, we chose as one of our main priorities reliance on the integration of educational technologies and high school science, closely related with industry. The goal was not only to prepare competitive specialists, but also to earn money with the help of this integration. We have not lost when made that choice. So, over the past eight years, the volume of research in MarSTU increases annually by 1,5-2 times. Its amount in 2002 was 10,7 million rubles., and according to the forecast it will overcome 150 million rubles be the end of 2010.

Besides the effective cooperation with successful businesses, our scientists make research in line with the thematic plan of Rosobrazovanie, scientific and technical programmes Rosnauka and Rosles, educational grant competitions, contracts with Russian and foreign organizations [4]. Researchers of MarSTU were the main experts in the development of forest plans (documents defining the strategy for forestry of the Russian regions for ten years) for the Nizhny Novgorod region, the Mari El Republic, Samara region.

Undergraduate and graduate students are involved in the research activities, in order to get valuable practical skills. At their disposal - a wide range of MarSTU facilities, including training and experimental forestry, botanical garden, modern multimedia laboratories, technopark, which brought together innovative structures of the university. And of course the Center of multiple- access with the unique equipment for the development and implementation of innovative technologies in the field of environmental management.

Based on the development of young researchers seven small innovative enterprises have already been founded at MarSTU, and three new ones are going to be opened by the end of the year. So the call of the Russian Government for transition from the commodity-based economy to knowledge economy has been heard.

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